

**Amendments to the Claims:**

The listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A method for reducing a level of certain chemical compounds in a sample, said method comprising subjecting said sample to at least one of an anaerobic treatment and an aerobic treatment wherein a valency of one or more redox mediator species is manipulated by encapsulated microorganisms such that, under anaerobic conditions, the one or more redox mediator species are reduced to a lower order valency, and under aerobic conditions, the redox mediator species are oxidized to a higher order valency, and wherein formation of insoluble particles comprising the chemical compounds is facilitated.

2. (Cancelled).

3. (Previously Presented) The method of Claim 1 wherein the chemical compounds comprise inorganic molecules.

4. (Previously Presented) The method of Claim 1 wherein the chemical compounds comprise organic molecules.

5. (Previously Presented) The method of Claim 1 wherein the chemical compounds comprise one or more of proteins, fatty acids, lipids, ammonium, organic acids, phenolic compounds, aromatic polycyclic oxygenated compounds, nucleic acids, sulfates, phosphates, radionuclides and cyanides.

6. (Previously Presented) The method of Claim 1 wherein the sample is a liquid, semi-liquid, solid, particulate or gaseous or a mixture thereof.

7. (Original) The method of Claim 6 wherein the sample is an environmental, industrial or domestic sample.

8. (Previously Presented) The method of Claim 1 wherein the sample is wastewater, water, solid waste, or polluted soil.

9. (Previously Presented) The method of Claim 1 wherein the redox mediator species are selected from the group consisting of zero valence metal species, metallic ions, metal-containing oxides, hydroxides, chelates, non-biodegradable and insoluble inorganic constituents with variable oxidation-reduction states, or a combination thereof.

10. (Previously Presented) The method of Claim 9 wherein the metallic and metal-containing species are selected from the group consisting of iron, nickel, cobalt, manganese, vanadium and combinations thereof.

11. (Previously Presented) The method of Claim 9 wherein the cationic metal is provided as metal salts or metal slurry.

12. (Previously Presented) The method of Claim 9 wherein the microorganisms are iron-reducing microorganisms selected from the genera consisting of: *Acidobacterium*, *Aerobacter*, *Bacillus*, *Clostridium*, *Deferribacter*, *Desulfuromonas*, *Desulfuromusa*, *Esherichia*, *Ferribacterium*, *Ferrimonas*, *Geobacter*, *Geovibrio*, *Geothrix*, *Pantoea*, *Pseudomonas*, *Sulfurospirillum*, *Shewanella*, *Thermoterrabacterium*, *Thermotoga*, and *Thermus*, or a mixed culture thereof, or an enrichment culture of microorganisms capable of reducing iron (III).

13. (Previously Presented) The method of Claim 9 wherein the microorganisms are iron-oxidizing microorganisms selected from the genera consisting of *Acidianus*, *Acidithiobacillus*, *Ferroglobus*, *Ferromicrobium*, *Gallionella*, *Hyphomicrobium*, *Leptothrix*, *Naumannella*, *Ochrobium*,

*Leptospirillum, Pedomicrobium, Rhodovulum, Rhodococcus, Sphaerotilus, Siderocapsa, Sulfolobus, Stenotrophomonas, and Thiobacillus, or a mixed cultures of aforementioned microorganisms, or an enrichment culture of the microorganisms capable of oxidizing iron (II).*

14. (Currently Amended) A method for reducing a level of a chemical compound in one or more of wastewater, surface water, ground water, solid waste, and polluted soil, said method comprising subjecting said wastewater, surface water, ground water, solid waste, or polluted soil to one or more of anaerobic treatment and aerobic treatment wherein a valency of one or more cationic iron species is manipulated by encapsulated microorganisms, wherein under anaerobic conditions, cationic iron species are reduced to a lower order valency, and under aerobic conditions, cationic iron species are oxidized to a higher order valency by said microorganisms, and the formation of insoluble particles comprising the chemical compound is facilitated.

Claims 15-19. (Cancelled)

20. (Currently Amended) A method for reducing a level of one or more chemicals in a waste sample, said method comprising (1) introducing to said waste sample one or more cationic iron species, and (2) subjecting said waste sample to one or both of anaerobic treatment and aerobic treatment, wherein the valency of one or more cationic iron species is changed by encapsulated microorganisms where under anaerobic conditions, the cationic iron species are reduced to a lower order valency, wherein under aerobic conditions, the cationic iron species are oxidized to a higher order valency, and wherein the formation of insoluble particles comprising the one or more chemicals to be removed is facilitated.

21. (Previously Presented) The method according to Claim 20, wherein the waste sample is wastewater, surface water, ground water, solid waste, or polluted soil.

22. (Previously Presented) The method according to Claim 20, wherein the waste sample is subject to a cycled aerobic-anaerobic treatment scheme.

23. (Previously Presented) The method according to Claim 20, wherein the waste sample is subject to a cycled anaerobic-aerobic treatment scheme.

24. (Previously Presented) The method according to Claim 20, wherein the waste sample is subject to a sequential aerobic-anaerobic treatment scheme.

25. (Previously Presented) The method according to Claim 20, wherein the chemical to be removed is ammonium.

26. (Previously Presented) The method according to Claim 20, wherein the cationic iron species comprise a ferrous salt or a ferric salt.

27. (Previously Presented) The method according to Claim 20, wherein the cationic iron species comprises iron ore or iron slurry.

28. (Previously Presented) The method according to Claim 20, wherein the microorganisms are introduced as activated sludge.

29. (Previously Presented) A composition for removing or otherwise reducing the level of inorganic or organic chemicals in an waste sample, comprising one or more aerobic or anaerobic iron-reducing microorganisms and a cationic iron compound, wherein the microorganisms are encapsulated within the cationic iron compound.

30. (Cancelled).

31. (Previously Presented) A method for assessing the capacity of a system for removing one or more chemicals from a waste sample, wherein the

system comprises iron cation compounds and bioredox microorganisms that are capable of modulating the redox potential of the iron cation compounds, the method comprising: (1) establishing at least one index value  $I_v$  for at least one feature associated with bioredox microorganisms present in the system, and (2) establishing from  $I_v$  at least one potency value  $P_v$  corresponding to the capacity of the bioredox microorganisms to establish a given redox potential for the iron cation compound.